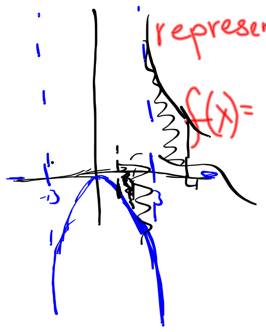
6.6/58) a) Over what open interval does $\int_1^4 \frac{1}{t^2-9}\,dt$ $F(x) = \int_0^x \frac{1}{t^2-9}\,dt$ represent an antiderivative of $f(x) = \frac{1}{x^2-9}$?

(-3,3)



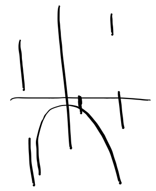
$\int_1^2 \frac{1}{t^2-9}\,dt$

$\lim_{b\to 3} \int_1^b \frac{1}{t^2-9}\,dt$

Jan 6-7:33 AM

6.6 58b $F(x) = \int_1^x \frac{1}{t^2-9}\,dt = 0$?

when does $F(x)$ crosses x-axis $0, 3$



$\int_1^1 \frac{1}{t^2-9}\,dt =$ "Area" of width $0 = 0$

Jan 6-7:35 AM

6.6/18 $\int_0^1 x - \sec x \tan x\,dx$

$\left(\frac{x^2}{2} - \sec x\right)\Big|_0^1$

$\left(\frac{1}{2} - \sec 1\right) - \left(0 - \sec 0\right)$ $\quad \frac{1}{\cos 0}$

$= \frac{1}{2} - \sec 1 + 1$

$= \frac{3}{2} - \sec 1$

Jan 6-7:35 AM

6.6/26 $\int_4^9 4y^{-1/2} + 2y^{1/2} + y^{-5/2}\,dy$

$\left(8y^{1/2} + \frac{4}{3}y^{3/2} - \frac{2}{3}y^{-3/2}\right)\Big|_4^9$

$\left(24 + \frac{4}{3}(3^3) - \frac{2}{3}\frac{1}{3^3}\right) - \left(16 + \frac{4}{3}(8) - \frac{2}{3}\frac{1}{8}\right)$

$44 - \frac{2}{81} - \frac{32}{3} + \frac{1}{12}$

Jan 6-7:35 AM

L'Hospital

vs

L'Hôpital

Italian

French

Spanish

Portugese

Romanian

forêt

↳ forest

fenêtre

fenester

Jan 6-8:00 AM

6.6/50 a) $\frac{d}{dx}\int_0^x \frac{1}{1+\sqrt{t}}\,dt$

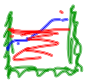
$= \frac{1}{1+\sqrt{x}}$

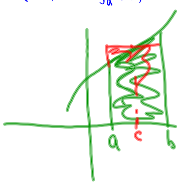
Jan 6-8:14 AM

6.6 | Average Value of a Function and → Mean Value Theorem for Integrals

If $f(x)$ is continuous on $[a,b]$
then $\exists\, c \in (a,b)$ such that

$(b-a)f(c) = \int_a^b f(x)\,dx$





Jan 6-8:16 AM

Average Value of a Theorem

MVT/Integrals $\exists\, c$ such that

$(b-a)f(c) = \int_a^b f(x)\,dx$

We define the average value of $f(x)$

between a and b to be

$$f_{avg} = \frac{\int_a^b f(x)\,dx}{b-a}$$

Jan 6-8:25 AM

Find the average value of
$y = \sqrt{x}$
over the interval $[1,4]$

$$\text{Avg Value} = \frac{\int_1^4 \sqrt{x}\,dx}{4-1}$$

$$= \frac{\int_1^4 x^{1/2}\,dx}{3} = \frac{\left(\frac{2x^{3/2}}{3}\right)\Big|_1^4}{3}$$

$$\frac{\left(\frac{2(8)}{3} - \frac{2}{3}(1)\right)}{3} = \frac{16-2}{9} = \frac{14}{9}$$

$$\frac{\frac{14}{3}\left(\frac{1}{3}\right)}{3\left(\frac{1}{3}\right)} = \frac{\frac{14}{9}}{1}$$

Jan 6-8:29 AM

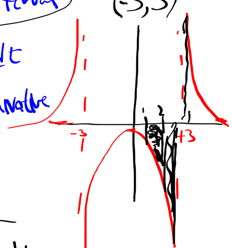
6.6/59, 61

6.7/55-60

practice midterm

Jan 6-8:40 AM

6.6/58) Over what open interval → $(-3,3)$ does $F(x) = \int_1^x \frac{1}{t^2-9}\,dt$ represent an antiderivative of $f(x) = \frac{1}{t^2-9}$?



b) $F(x) = \int_1^x \frac{1}{t^2-9}\,dt = 0$

when $x = 1$

$F(1) = \int_1^1 \frac{1}{t^2-9}\,dt = 0$

Jan 6-11:28 AM

6.6/53) Let $F(x) = \int_2^x \sqrt{3t^2+1}\,dt$

a) $F(2) = \int_2^2 \sqrt{3t^2+1}\,dt = 0$

b) $F'(2) = \frac{d}{dx}(F(x)) = \frac{d}{dx}\int_2^x \sqrt{3t^2+1}\,dt \overset{FTC\text{-}2}{=} \sqrt{3x^2+1}$

$F'(2) = \sqrt{3(2)^2+1} = \sqrt{13}$

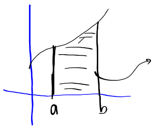
c) $F''(2) = \frac{d}{dx}(F'(x)) = \frac{d}{dx}\left(\sqrt{3x^2+1}\right) = \frac{1}{2}(3x^2+1)^{-1/2}($

$\frac{d^2}{dx^2}\left(\int_2^x \sqrt{}\,dt\right)$

$= \frac{3x}{\sqrt{3x^2+1}}$ $F''(2) = \frac{3 \cdot 2}{\sqrt{13}} = \frac{6}{\sqrt{13}}$

Jan 6-11:28 AM

6.6 / Mean Value Theorem for Integrals and Average Value of a function



Area = $\int_a^b f(x)\,dx$

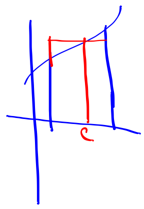
Jan 6-11:28 AM

MVT for Integrals

If $f(x)$ is continuous on $[a,b]$

then $\exists$ (there exists) $c \in$ (element) $[a,b]$ such that

$$(b-a)f(c) = \int_a^b f(x)\,dx$$



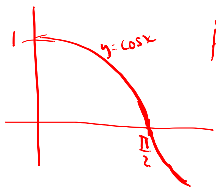
Jan 6-11:28 AM

Avg value of a function $f(x)$ over an interval $[a,b]$

is : $\dfrac{\int_a^b f(x)\,dx}{b-a} = f(c)$

Jan 6-12:12 PM

Find the average value of $\cos x$ on $[0, \pi/2]$



Avg Value $= \dfrac{\int_0^{\pi/2} \cos x\,dx}{\pi/2 - 0}$

$= \dfrac{\sin x\big|_0^{\pi/2}}{\pi/2} = \dfrac{\sin\frac{\pi}{2} - \sin 0}{\pi/2}$

$= \dfrac{1-0}{\pi/2} = 2/\pi$

Jan 6-12:13 PM

Avg Value of $y = \frac{1}{x}$ on $[1,4]$

$\dfrac{\ln(4)}{3}$

antiderivative of $\frac{1}{x} = \ln(x)$

$\dfrac{F(B)-F(A)}{B-A} = \dfrac{\ln(4)-\ln(1)}{4-1}$

Jan 6-12:21 PM